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Held

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(54) **DEVICE FOR OPENING THE CABINET DOOR OF A CABINET BODY**

(75) Inventor: **Wolfgang Held**, Hard (AT)

(73) Assignee: **DONGTAI HARDWARE PRECISION (HONG KONG) LIMITED**, Tsuen Wan, N.T., Hong Kong (HK)

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E05F 13/00 (2006.01)
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CPC ***E05F 13/00*** (2013.01); ***E05C 19/165*** (2013.01); ***E05F 1/105*** (2013.01); ***E05F 5/02*** (2013.01);
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(58) **Field of Classification Search**
CPC .. E05F 13/00; E05F 1/105; E05F 5/02; E05C 19/165; E05Y 2201/212; E05Y 2201/218;
(Continued)

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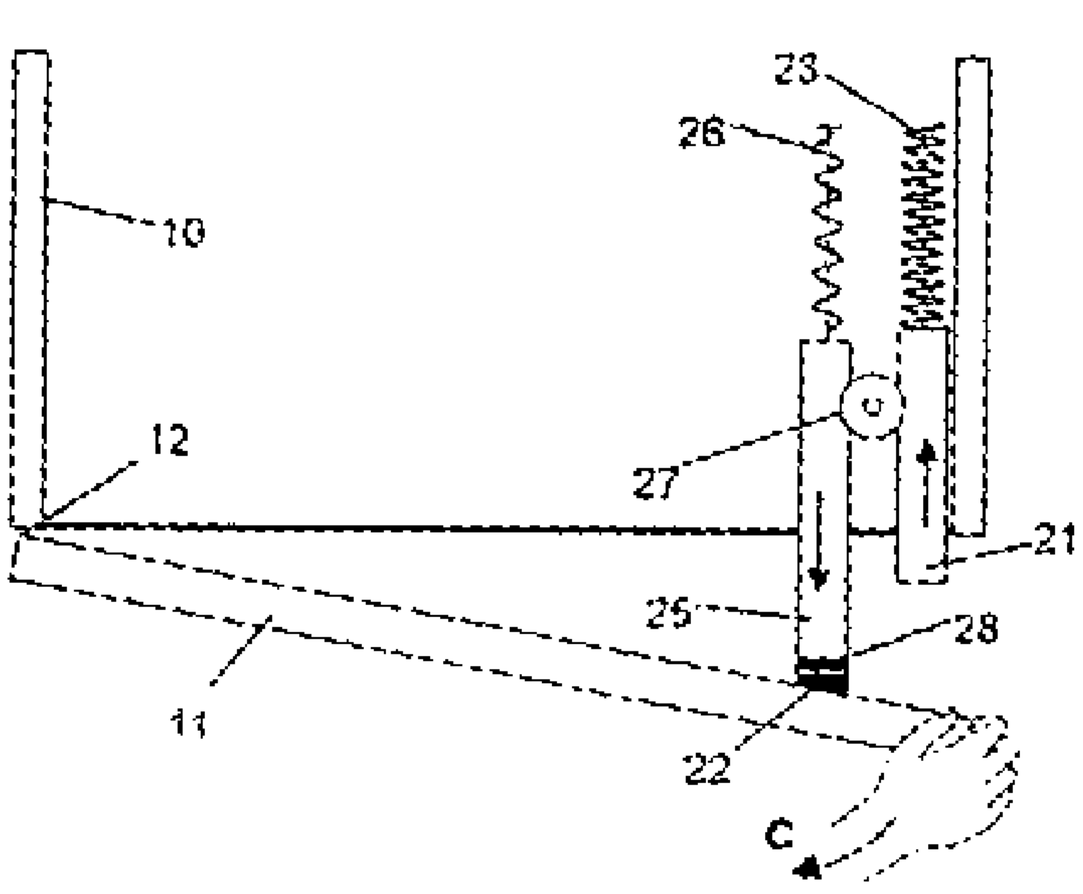
Primary Examiner — Daniel J Troy
Assistant Examiner — Timothy M Ayres
(74) *Attorney, Agent, or Firm* — John Alumit

(57) **ABSTRACT**

Device for opening cabinet door of cabinet body. Cabinet door is attached to cabinet body by self-closing hinges. Cabinet door is held in closed position at a small distance from the front of cabinet body. In order to allow cabinet door to be opened without gripping elements, without hindering the self-closing of the hinges, there is a unit having ejection piston with a locking apparatus and tension rod in cabinet body. Ejection piston is supported in the unit by compression spring, and tension rod is supported in the unit by tension spring. Ejection piston and tension rod are coupled to each other by a control apparatus having a freewheel, and thus by tapping on cabinet door the opening of cabinet door can be initiated and cabinet door can be brought into an intermediate position. In the intermediate position, cabinet door can be grasped by a hand and opened further.

11 Claims, 15 Drawing Sheets



(51) **Int. Cl.**
E05C 19/16 (2006.01)
E05F 1/10 (2006.01)
E05F 5/02 (2006.01)

(52) **U.S. Cl.**
CPC ... *E05Y 2201/212* (2013.01); *E05Y 2201/218* (2013.01); *E05Y 2201/22* (2013.01); *E05Y 2201/232* (2013.01); *E05Y 2201/246* (2013.01); *E05Y 2800/11* (2013.01); *E05Y 2900/20* (2013.01)

(58) **Field of Classification Search**
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USPC 312/319.2
See application file for complete search history.

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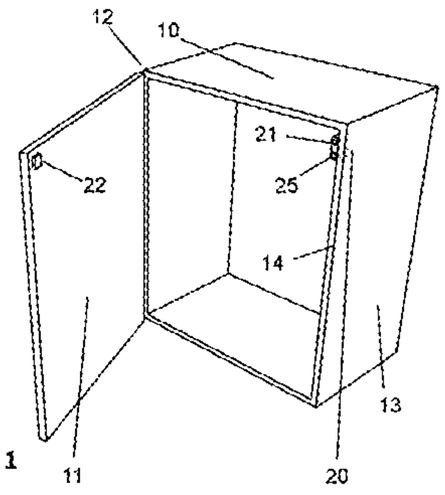


Fig. 1

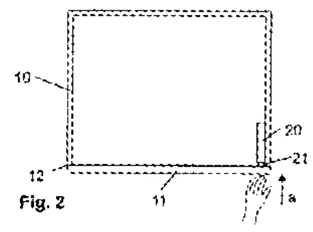


Fig. 2

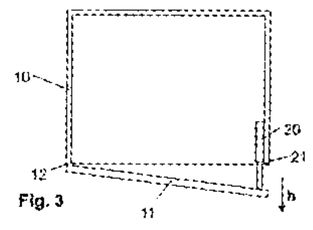
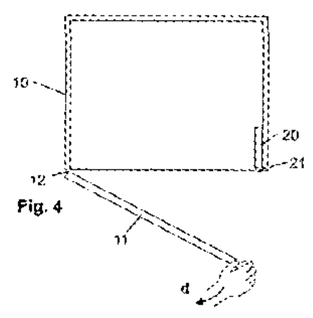


Fig. 3



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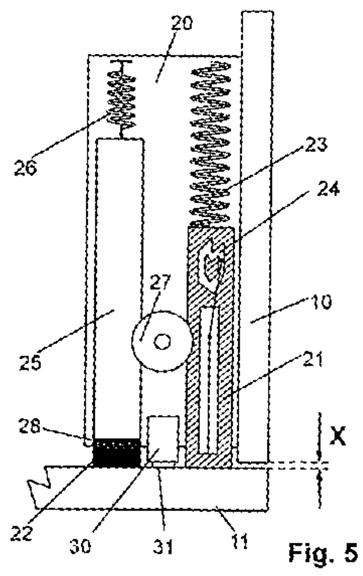


Fig. 5

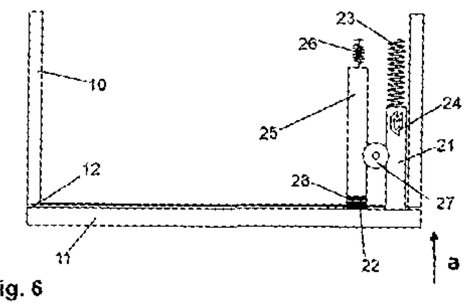


Fig. 6

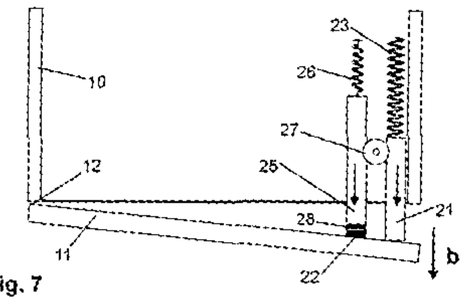
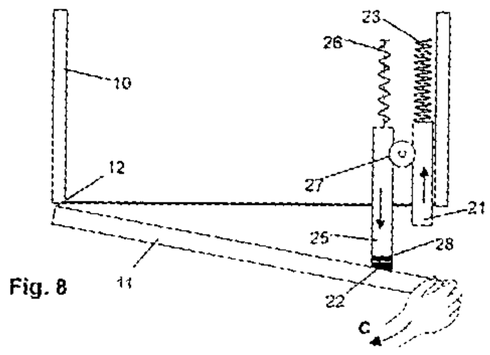


Fig. 7



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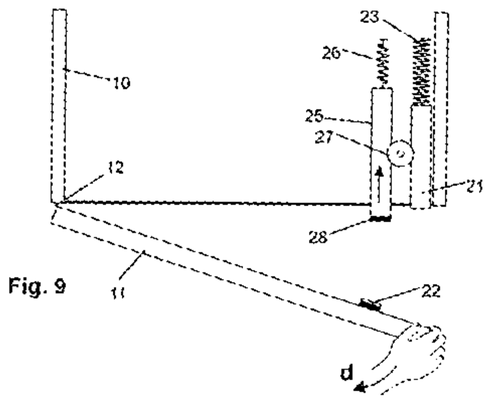


Fig. 9

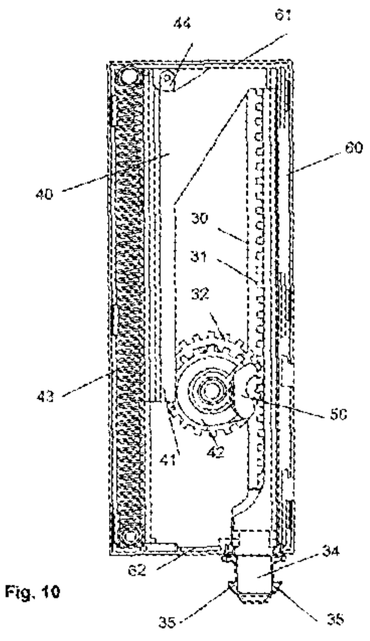


Fig. 10

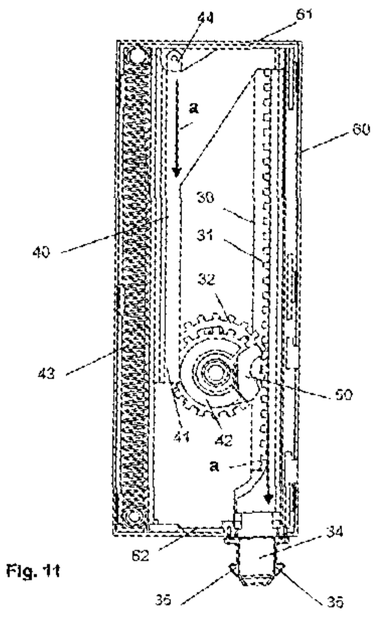


Fig. 11

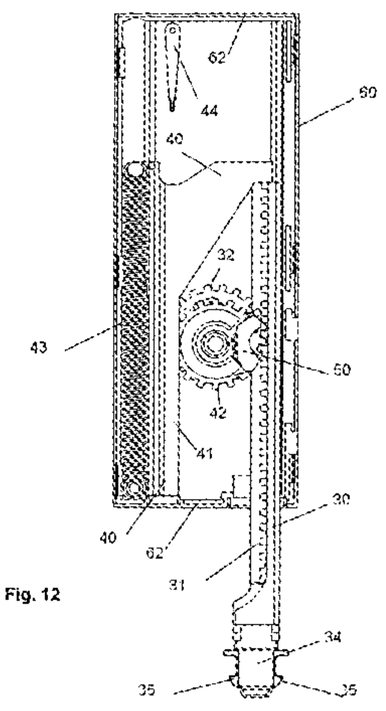


Fig. 12

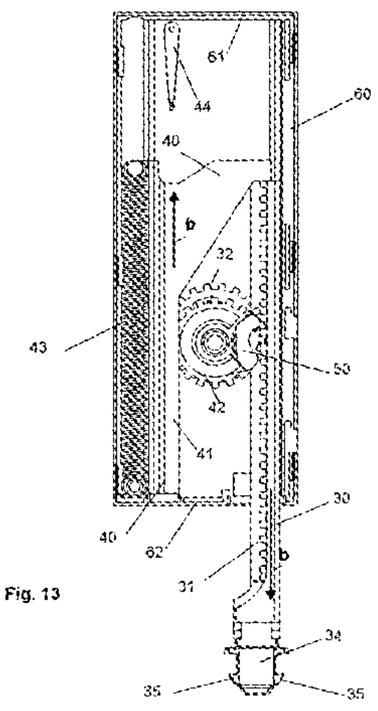
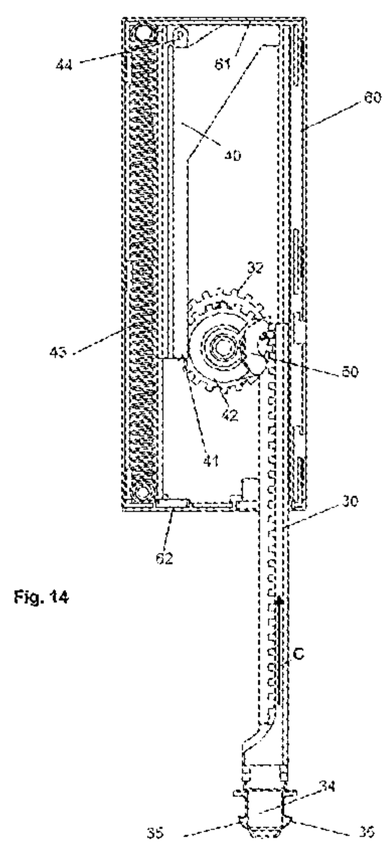


Fig. 13



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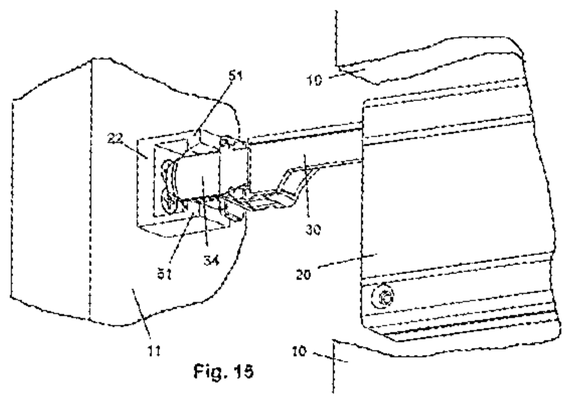

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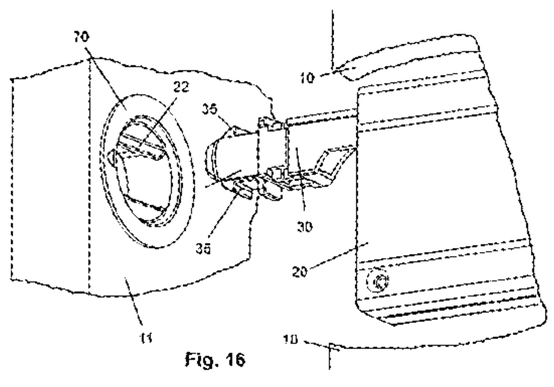

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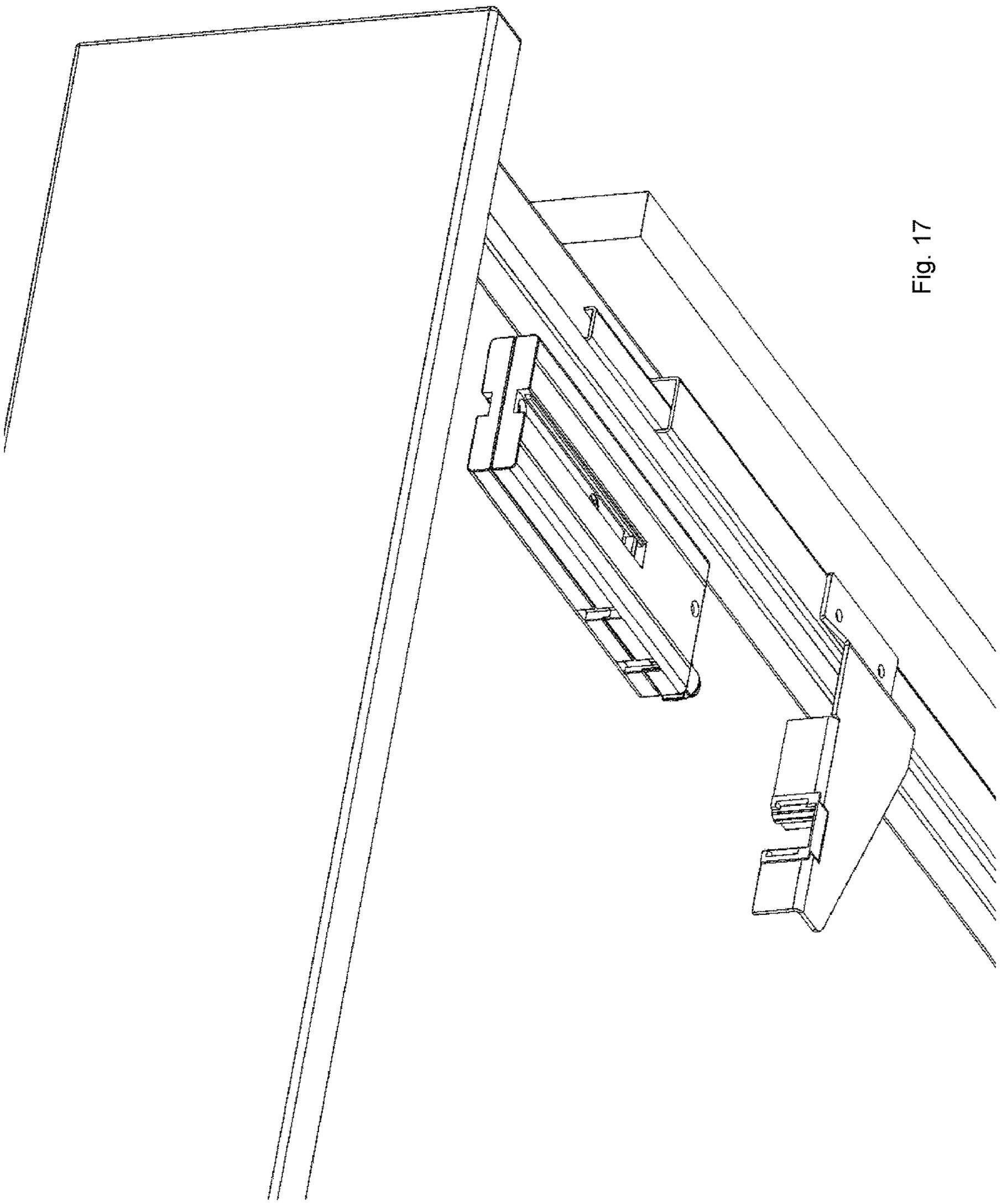

Fig. 17

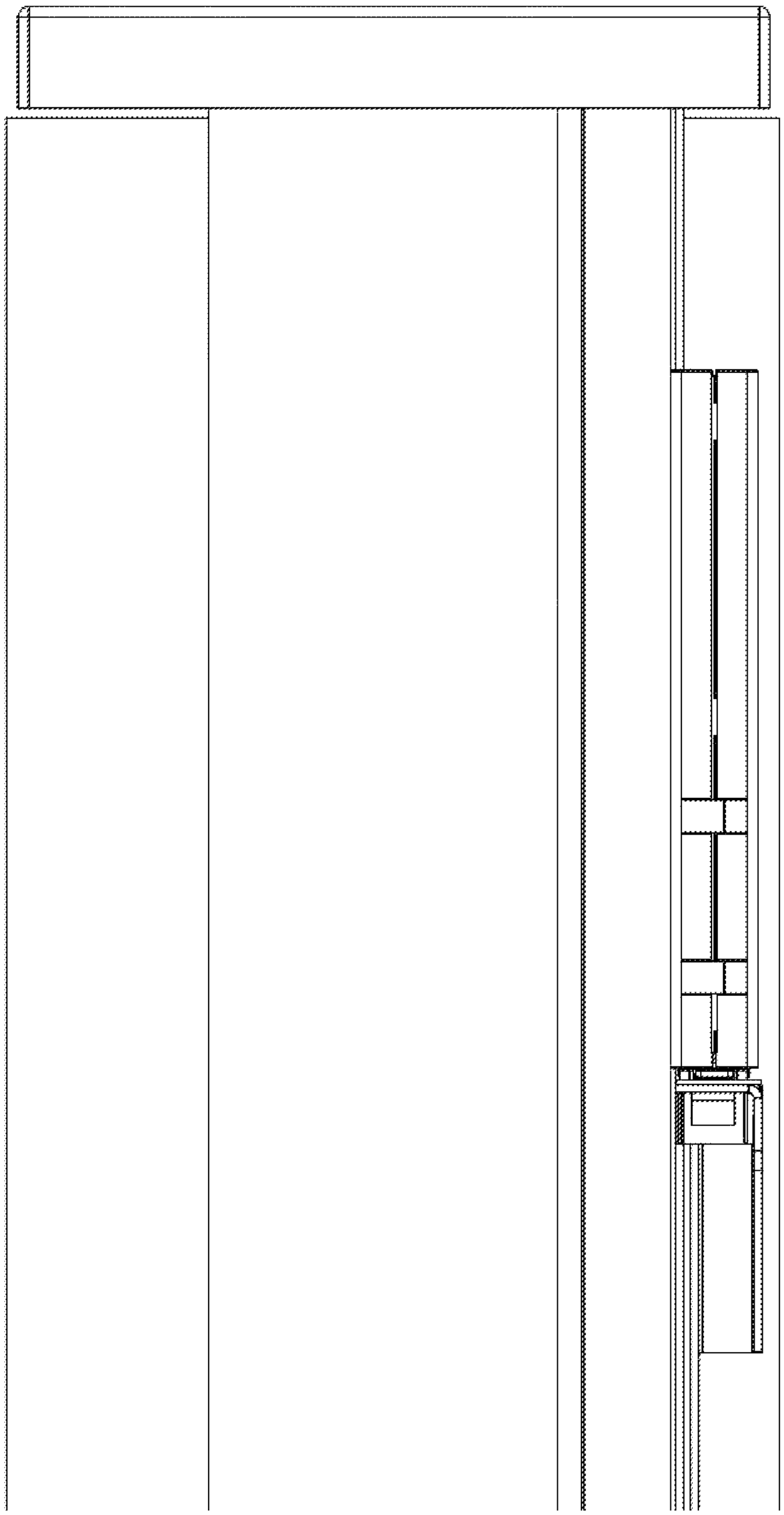

Fig. 18

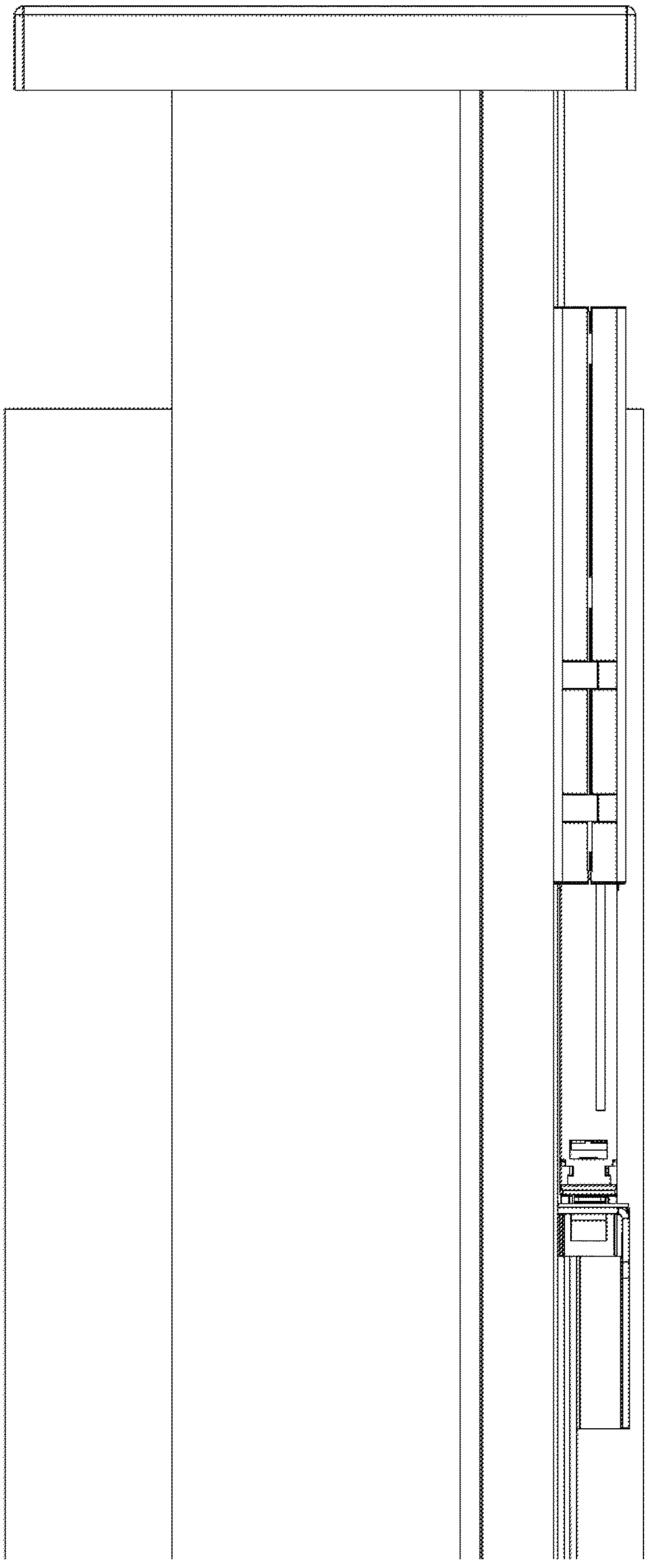

Fig. 19

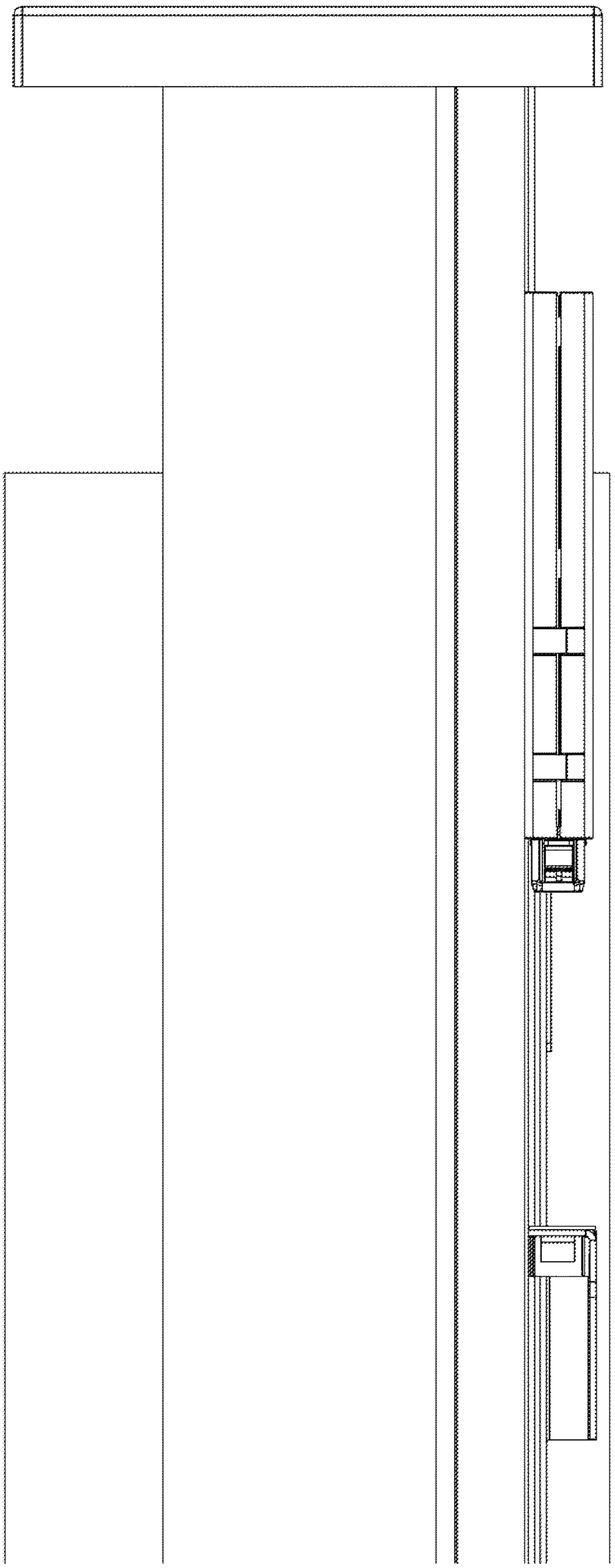

Fig. 20

DEVICE FOR OPENING THE CABINET DOOR OF A CABINET BODY

CROSS-REFERENCE TO RELATED APPLICATION

This application is a national stage application and claims the benefit of the priority filing date in PCT/EP2012/065164 referenced in WIPO Publication WO/2013/017666 filed on Aug. 2, 2012. The earliest priority date claimed is Aug. 2, 2011.

FEDERALLY SPONSORED RESEARCH

Not Applicable

SEQUENCE LISTING OR PROGRAM

Not Applicable

BACKGROUND

The invention relates to a device for opening the cabinet door of a cabinet body as defined by the preamble to claims **1** and **7**.

In conventional devices on the market, the cabinet door is mounted on the cabinet body via self-retracting hinges. This type of mounting has the advantage that precisely in the terminal angle of the closing motion of the cabinet door, a secure closure of the cabinet body is effected. The hinges also ensure that in the closed position, the cabinet door assumes a slight spacing x from the front of the cabinet body. However, the disadvantage of this device is that in order to be opened, the cabinet door must be provided with handles, handle fittings, and the like.

It is the object of the invention to develop a device for opening the cabinet door of a cabinet body that makes do without such handle elements, and in which the self-retraction of the hinges between the cabinet door and the cabinet body is unhindered.

This object is attained by means of the features of claim **1**.

SUMMARY

A unit comprising an ejection piston, having a compression spring and a locking unit, and a tension rod, having an extension spring, is disposed in the cabinet body. The ejection piston and the tension rod are coupled together via a control device that acts only upon the extension of the tension rod with the cabinet door and displaces the ejection piston out of the cabinet body counter to the tensile force of the extension spring. In the closed position of the cabinet door, the ejection bolt and the tension rod are jacked into the cabinet body, and the locking unit locks the jacked-in position of the ejection piston. When the cabinet door is tapped, the spacing between the cabinet door and the cabinet body is eliminated and the locking unit disengages. After the cabinet door has been tapped, the compression spring of the ejection piston displaces the ejection piston from the cabinet body, whereupon the tension rod is also pulled out of the cabinet body, counter to the tensile force of the tension rod, by a retaining element on the inside of the cabinet door. After this intermediate position has been manually undone, the tension rod is extended farther outward, since the retaining element maintains the connection with the cabinet door, and the ejection piston can be returned into the cabinet body and locked in the retracted position via the locking unit. After the cabinet door is opened farther manually, the tension rod is released and is returned via the extension spring into the retracted outset position. In this way, it becomes possible for the cabinet door, set in the closed position, to open far enough merely by being tapped so that it can be grasped with one's hand and opened farther. When the cabinet door is closed again, the ejection piston and the tension rod are automatically put into their closed positions. The cabinet door therefore does not need to have any handle elements, and the function of the self-retracting hinges is unhindered.

This device can also be used in the same manner for drawers and the like that can be pulled out from a compartment of a cabinet body.

In a further embodiment, the unit can additionally have a damper unit that damps or brakes the impact of the cabinet door on the cabinet body.

The control unit can be embodied as a freewheeling gear wheel, which ensures the coupling of the tension rod with the ejection piston only upon retraction of the tension rod into the cabinet body.

The unit is fastened to the inside of the side wall of the cabinet body that faces away from the hinges of the cabinet door. The face ends of the ejection piston and of the tension rod, in the closed position of the cabinet door, protrude by the spacing from the front of the cabinet body. This spacing x is specified by the self-retracting hinge.

The face end of the tension rod can be provided with a magnetically conductive damping lining.

A further embodiment can be learned from coordinate claim **7** and dependent claims **8-11**.

DRAWINGS

The invention will be described in further detail in conjunction with the drawings. In them:

FIG. **1** schematically shows the mounting of the unit in the cabinet body with a retaining element of the cabinet door;

FIG. **2** schematically shows the closed position of the cabinet door on the cabinet body;

FIG. **3** schematically shows the intermediate position of the cabinet door after the cabinet door has been tapped;

FIG. **4** schematically shows the cabinet door being opened farther manually; FIG. **5** shows details of a unit fastened in the cabinet body;

FIG. **6** shows the elements of the unit in the closed position of the cabinet door;

FIG. **7** shows the elements of the unit in an opened intermediate position;

FIG. **8** shows the elements when the cabinet door in the intermediate position is being grasped, with the control unit in action between the tension rod and the ejection piston;

FIG. **9** shows the elements of the unit as the cabinet door is opened still farther manually (motion d);

FIG. **10** shows another version of the device, which has an ejection piston, a tension spring and a tension element and is controlled by two gear wheels and a connection element, in the outset position;

FIG. **11** shows the initiation of the motions when the cabinet door is tapped; FIG. **12** shows the device in the intermediate position;

FIG. **13** shows the device upon further manual extension past the intermediate position;

FIG. **14** shows the device after the cabinet door is let go;

FIG. **15** shows the latching of the ejection rod with the retaining element mounted on the cabinet door; and

FIG. **16** shows the building in of the retaining element into the inside of the cabinet door.

FIGS. **17-20** show the device used in connection with a drawer.

DESCRIPTION

In FIG. **1**, a cabinet body **10** is shown, which has a hinged cabinet door **11** on one vertical side at the front. The hinging is done by conventional hinges **12** with self-retraction; that is, the last, small closing angle of the cabinet door **11** is effected in a defined manner by springs of the hinges **12**. A unit **20** is fastened opposite the hinges **12** and has an ejection piston **21** and a tension rod **25**, which in the outset position protrude from the front of the cabinet body **10** by a spacing x. When the cabinet door **11** is closed, this spacing x is ensured by the self-retracting hinge. The fastening of the unit **20** is done on the inside **14** of the side wall **13**.

FIG. **2** schematically shows the opening of the cabinet door **11** by tapping it in the direction a; the ejection piston **21** is definitive for the opening motion b of the cabinet door **11**. After that, the cabinet door **11** assumes an intermediate position, as shown in FIG. **3**. The cabinet door **11** is moved in the direction b by the ejection piston **21**. From this intermediate position in FIG. **3**, the cabinet door **11** can be opened farther by grasping it with one's hand, whereupon the ejection piston **21** and the tension rod **25** resume their outset position in the cabinet body **10**, as shown in FIG. **4**. The opening angle is defined by the motion d.

In FIG. **5**, one exemplary embodiment of the unit **20** is shown. The unit **20** has an ejection piston **21**, which is supported on the unit **20** by a compression spring **23** and has a locking unit **24**. At the same time, the unit **20** has a tension rod **25**, which is supported in the unit **20** by an extension spring **26**. The ejection piston **21** is coupled to the tension rod **25** via a control unit **27** embodied as a freewheeling gear wheel. The control unit **27** is explained in terms of its mode of operation in conjunction with FIGS. **6-9**. As FIG. **5** also shows, the unit **20** can have a damper unit **30**, which from a cushioned damper **31** damps or brakes the impact of the cabinet door **11** on the front of the cabinet body **10**. The cabinet door **11** has a retaining element **22**, which is oriented toward the face end of the tension rod **25** and can be embodied as a magnet and which carries the tension rod **25** with it until the intermediate position of FIG. **7** is established. The face end of the tension rod **25** can be provided with a magnetically conductive damping lining **28**.

FIG. **6** shows the outset closed position of the unit **20**. The ejection piston **21** is subject to the tensing force of the compression spring **23** and the cooperating locking unit **24**. The tension rod **25** too is retracted by the extension spring **26** correspondingly far into the cabinet body **10**. The cabinet door **11** is additionally retained by the retaining element **22** on the tension rod **25**. As the motion arrow a indicates, this outset position of the cabinet door **11** can be tripped and opened by tapping on the cabinet door **11** at a. In the process, the locking unit **24** is disengaged, so that the compression spring **23** can move the ejection piston **21** out of the cabinet body **10**. The extension spring **26** of the tension rod **25** can follow along with this extension motion, since the retaining element **22** maintains the connection with the cabinet door **11**, as FIG. **7** shows.

In this intermediate position, the cabinet door **11** can be grasped with one's hand and opened farther, as FIG. **8** shows with the motion c.

In this opening motion c, the tension rod **25** is coupled with the ejection piston **21** via the control unit **27** in such a way that the ejection piston is retracted into its outset position and locked with the locking unit **24**. Finally, the tension rod **25** reaches its terminal extension position, and the retaining element **22** releases the connection with the cabinet door **11**. The tension rod **25** can be retracted by the extension spring **26** into the cabinet door **10** into the outset position, as can be seen from FIG. **9**.

In FIGS. **10-16**, a different version of the device is shown, which operates with the same functional steps. This device, which is claimed in its own coordinate claim and dependent claims **8-11**, has an ejection element **30** and a tension element **40** with a tension spring **43**.

The unit **20** with the housing **60** is fastened to an inner wall, which is opposite the hinges. With an end piece **34** that has retaining elements **35**, the ejection element **30** protrudes from the front of the cabinet compartment, in such a way that the housing **60** is flush with the face end of the cabinet body **11**.

FIG. **10** shows the device in the outset position, in which the cabinet door **11** is connected to the end piece **34** and is remote from the face end of the cabinet body **10** by the spacing x. The device has both the ejection element **30**, which has a set of teeth **31**, and the tension element **40**, with which the tension spring **43** is associated. The ejection element **30** and the tension element **40** have sets of teeth **31** and **41**, which are oriented counter to one another. The sets of teeth **31** and **41** mesh diagonally with two gear wheels **32** and **42**. A connection element **50** is associated with the two gear wheels **32** and **42** and can connect the two gear wheels **32** and **42** to one another in such a way that they rotate in the same direction. If no connection is made between the two gear wheels **32** and **42**, then the two gear wheels **32** and **42** are rotatable in arbitrary directions independently of one another. The bearing axes of the gear wheels are offset from one another. The bearing axis of the gear wheel **32** is offset by a small spacing in the direction of the back wall **61** of the housing **60**, so that differences when the two gear wheels are rotating in the same direction can be better compensated for.

In the outset position, the tension spring **43** is tensed. The tension element **40** rests against the back wall **61** of the housing **60**. A rotatably supported locking element **44** locks the tension element **40** and the tension spring **43**.

When one taps on the cabinet door **11**, the end piece **34** of the ejection element **30** is thrust into the unit **20**. The locking element **44** will then release the tension spring **43**, so that as FIG. **11** shows, both the tension element **40** and the ejection element **30** execute a motion in the direction of the arrow a. The cabinet door **11** is now firmly held in the intermediate position (FIG. **12**), and the tension spring **43** is relaxed and the tension element **40** rests on the front wall **62** of the housing **50**. Upon this displacement, the two gear wheels **32** and **42** are connected to one another via the connection element **50**.

If the cabinet door **11** in the intermediate position (FIG. **12**) is grasped manually, then the ejection element **30** also follows along for a short displacement distance, as can be seen from FIG. **13**. The gear wheel **32** is rotated, as is the gear wheel **42**, both clockwise. This causes tensing of the tension spring **43** and causes it to be locked in the tensing position by the locking element **44**. After that, the ejection element **30** releases the cabinet door **11**. The ejection element **30** can be brought from this terminal position upon closure of the cabinet door **11** into the outset position, since when the gear wheels **32** and **42** are not connected to one another, the tension element **40** and the tension spring **43** are unaffected. Only once the final displacement distance defined by the spacing x is brought about by tapping on the

cabinet door **11** is the tension spring **43** unlocked and can then be relaxed. The device has then returned to the outset position of FIG. **10**.

A special feature here is also the connection between the cabinet door **11** and the end piece **34** of the ejection element **30**. This end piece on the end of the ejection element **30** has detent elements **35**, which latch with counterpart detent elements **51** of the retaining element **22**. The retaining element **22** is preferably secured in a round receptacle **70** on the inside of the cabinet door **11**. The terminal position of the extension motion of the ejection element **30** is determined by impacts of the ejection element **30** on the front wall **61** of the housing **60**. The end piece **34** is still displaceable out of this position of the ejection element **30** to a limited extent; this displacement is determined by impacts on the end piece **34** and the ejection element **30**. With this displacement, the detent elements **35** can also be pivoted, so that the latching is undone and the cabinet door **11** can be fully opened. The detent elements **35** latch to the counterpart detent elements **51** of the retaining element **22** whenever the end piece **34** is introduced back into the retaining element **22**.

What is claimed:

1. A device for opening a cabinet door (**11**) of a cabinet body (**10**), in which the cabinet door (**11**) is mounted on the cabinet body (**10**) by means of self-retracting hinges (**12**), and in a closed position the cabinet door (**11**) is kept at a spacing (x) from the front of the cabinet body (**10**),

Wherein

a unit (**20**) comprising an ejection piston (**21**) and a tension rod (**25**), the ejection piston having a compression spring (**23**) and a locking unit (**24**), and the tension rod having an extension spring (**26**), is disposed in the cabinet body (**10**);

the ejection piston (**21**) and the tension rod (**25**) are coupled together via a control device (**27**) which acts only upon retraction of the ejection piston (**21**) into the cabinet body (**10**) and displaces the tension rod (**25**) out of the cabinet body (**10**) counter to the tensile force of the extension spring (**26**);

in the closed position of the cabinet door (**11**), the ejection piston (**21**) and the tension rod (**25**) are stored in the cabinet body (**10**), and the locking unit (**24**) locks the stored position of the ejection piston (**21**);

when the cabinet door (**11**) is pressed (a), the spacing (x) between the cabinet door (**11**) and the cabinet body (**10**) is eliminated and the locking unit (**24**) can be disengaged;

after the cabinet door (**11**) has been pressed (a), the compression spring (**23**) of the ejection piston (**21**) is displaced out of the cabinet body (**10**), whereupon the tension rod (**25**) is also displaced out of the cabinet body (**10**) counter to the tensile force of the extension spring (**26**) by a retaining element (**22**) on the inside of the cabinet door (**11**;

after the intermediate position has been achieved by further opening the cabinet door (FIGS. **8**, **9**), the tension rod (**25**) is extensible farther outward, since the retaining element (**22**) maintains the connection with the cabinet door (**11**), and the ejection piston (**21**) can be returned into the cabinet body (**10**) and locked via the control unit (**27**); and

after further manual opening of the cabinet door (**11**), the tension rod (**25**) is released and is returned via the extension spring (**26**) into the retracted outset position (FIG. **9**).

2. The device of claim **1**, wherein the device for opening a cabinet door can be used for drawers that can be pulled out from a compartment of a cabinet body.

3. The device of claim **1**, wherein the unit (**20**) additionally has a damper unit (**30**), which damps or brakes the impact of the cabinet door (**11**) on the cabinet body (**10**).

4. The device of claim **1**, wherein the control unit (**27**) is embodied as a freewheeling gear wheel, which ensures coupling of the tension rod (**25**) with the ejection piston (**21**) only upon retraction of the tension rod (**25**) into the cabinet body (**10**).

5. The device of claim **1**, wherein

the unit (**20**) is fastened to the inside (**14**) of the side wall (**13**) of the cabinet body (**10**) that faces away from the hinges (**12**) of the cabinet door (**11**); and

the face ends of the ejection piston (**21**) and of the tension rod (**25**), in the closed position of the cabinet door (**11**), protrude by the spacing (x) from the front of the cabinet body (**10**).

6. The device of claim **5**, wherein the face end of the tension rod (**25**) is provided with a magnetically conductive damping lining (**28**).

7. A device for opening the cabinet door (**11**) of a cabinet body (**10**), in which the cabinet door (**1**) is mounted on the cabinet body (**10**) by means of self-retracting hinges (**12**), and in the closed position the cabinet door (**11**) is kept at a spacing (x) from the front of the cabinet body (**10**), wherein

a unit (**20**) comprising an ejection element (**30**) having tooth spacing (**31**), a tension element (**40**) with tooth spacing (**41**), and a tension spring (**43**) are disposed in the cabinet body (**10**);

the tooth spacings (**31**, **41**) of the ejection element (**30**) and of the tension element (**40**) mesh with separate gear wheels (**32**, **42**);

the two gear wheels (**32**, **42**) are connectable to one another via a connecting element (**50**) that acts only when the ejection element (**30**) is pulled out, whereupon the sets of teeth (**31**, **41**) of the ejection element (**30**) and of the tension element (**40**) mesh diametrically with the separate gear wheels (**32**, **42**);

the connection of the two gear wheels (**32**, **42**) is effected via a connecting element (**40**), which only when the ejection element (**30**) is pulled out undoes the connection of the two gear wheels (**32**, **42**) , whereupon the tension spring (**43**) returns to the outset position and the ejection element (**30**) reaches an intermediate position;

thereupon this outward motion of the ejection element (**30**) can be initiated by pressing on the cabinet door (**11**), whereupon in the intermediate position the ejection element (**30**) is still kept on the cabinet door (**11**);

as the cabinet door (**11**) is opened farther manually, the ejection element (**30**) can be briefly entrained with it, whereupon the connection element (**50**) connects the two gear wheels (**32**, **42**) and initiates the tensing and locking of the tension element (**40**);

when the final extension position of the ejection element (**30**) is reached, the cabinet door (**11**) can be released; and

upon closure of the cabinet door (**11**), the ejection element (**30**) can be pushed into the cabinet compartment and thus into the unit (**20**).

8. The device of claim **7**, wherein

the tensed position of the tension spring (**43**) is limited by the impact of the tension element (**40**) on the back wall (**61**) of the housing (**60**) of the unit (**20**); and

the outset position of the tension spring (**43**) is determined by the impact of the tension element (**40**) on the front wall (**62**) of the housing (**60**) of the unit (**20**).

9. The device of claim **7**, wherein

the ejection element (**30**), at its tip, has an end piece (**34**) with detent elements (**35**);

the detent elements (**35**) of the end piece (**34**), when the cabinet door (**11**) is in contact with them, latch to counterpart detent elements (**51**) of the retaining element (**22**) fastened to the inside of the cabinet door (**11**); and

this detent connection can be released when the end piece (**34**) of the ejection element (**30**) has been put, past the intermediate position, into its own terminal position.

10. The device of claim **9**, wherein the end piece (**34**) is displaceable via a separate adjusting rod in the ejection element (**30**), and the terminal position of the end piece (**34**) is determined by impacts of the ejection element (**30**).

11. The device of claim **7**, wherein

the two gear wheels (**32**, **42**) are supported via their own bearing axes; and

the bearing axis of the gear wheel (**32**) meshing with the ejection element (**30**) is offset in the direction of the back wall (**61**) of the housing (**60**) of the unit (**20**).

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